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PATENT APPLN. NO. 10/519,073  
RESPONSE UNDER 37 C.F.R. §1.111

PATENT  
NON-FINAL

IN THE SPECIFICATION:

The paragraph beginning at page 19, line 11 has been amended as follows:

In the negative electrode, the heat treatment resulted in the production of polyimide from the polyamic acid. The ~~polyamide~~ polyimide content, by weight, of the active material layer was 18.2 %. Polyimide was found to have a density of 1.1 g/cm<sup>3</sup> and constitute 31.8 % of the total volume of the active material layer.

The paragraph beginning at page 23, line 15 has been amended as follows:

The procedure of Experiment 1 was followed to construct a battery B1, except that a [[A]] 33 μm thick, rolled copper foil (surface roughness Ra: 0.1 μm) [[was]] roughened at its surface by electrolytic copper plating to a surface roughness Ra of 0.5 μm. ~~In Experiment 1, the resulting copper foil (current collector b1) was used in place of the electrolytic copper foil (current collector a1) with a surface roughness Ra of 0.5 μm. Otherwise, the procedure of Experiment 1 was followed to construct a battery B1.~~ After the roughening treatment, the current collector b1 was 35 μm thick. In addition, the procedure of Experiment 1 was followed to construct a battery A2, except that a 33 μm thick,

rolled copper alloy (Cu-0.03 wt.% Zr) foil (surface roughness Ra: 0.1  $\mu$ m) ~~[[was]]~~ roughened at its surface by electrolytic copper plating to a surface roughness Ra of 0.5  $\mu$ m. ~~In Experiment 1, the resulting copper alloy foil (current collector a2) was used in place of the electrolytic copper foil (current collector a1) having a surface roughness Ra of 0.5  $\mu$ m. Otherwise, the procedure of Experiment 1 was followed to construct a battery A2.~~ After the roughening treatment, the current collector a2 was 35  $\mu$ m thick. The current collectors b1 and a1 were subjected to a heat treatment under the same conditions as in the electrode fabrication (i.e., under argon atmosphere at 400 °C for 30 hours) and then measured for thickness, tensile strength, proportional limit, elongation at break and elastic elongation limit. The measured values therefor are shown in Table 3.

The paragraph beginning at page 24, line 17 has been amended as follows:

~~In Experiment 1,~~ The procedure of Experiment 1 was followed to construct batteries A3 and A4, except that a 35  $\mu$ m thick electrolytic copper foil (current collector a3 or a4) composed of the same material as the current collector a1 and having a surface roughness Ra of 0.2  $\mu$ m or 0.17  $\mu$ m was used in place of the

electrolytic copper foil (current collector a1) having a surface roughness Ra of 0.5  $\mu\text{m}$ . ~~Otherwise, the procedure of Experiment 1 was followed to construct batteries A3 and A4.~~

The paragraph beginning at page 25, line 6 has been amended as follows:

~~In Experiment 1, The procedure of Experiment 1 was followed to construct batteries A5 and A6, except that a 18  $\mu\text{m}$  thick electrolytic copper foil (current collector a5 or a6) composed of the same material as the current collector a1 and having a surface roughness Ra of 0.5  $\mu\text{m}$  or 0.2  $\mu\text{m}$  was used in place of the current collector a1. Otherwise, the procedure of Experiment 1 was followed to construct batteries A5 and A6.~~

The paragraph beginning at page 25, line 12 has been amended as follows:

~~In Experiment 1, The procedure of Experiment 1 was followed to construct a battery A7, except that the current collector a4 was used, the loading of the active material was altered and the thickness of the active material layer was increased to 95  $\mu\text{m}$ . Otherwise, the procedure of Experiment 1 was followed to construct a battery A7.~~

The paragraph beginning at page 25, line 17 has been amended as follows:

~~In Experiment 1, The procedure of Experiment 1 was followed to construct a battery A8, except that the current collector a5 was used, the loading of the active material was altered and the thickness of the active material layer was increased to 55  $\mu$ m. Otherwise, the procedure of Experiment 1 was followed to construct a battery A8.~~

The paragraph beginning at page 30, line 9 has been amended as follows:

(EXPERIMENT 4)

The procedure of Experiment 1 was followed, except that the binder  $\beta$ 1 (polyamic acid) was used in place of the binder  $\alpha$ 1, to construct a battery B2. In the negative electrode of the battery B2, the heat treatment produced polyimide from the polyamic acid. The ~~polyamide~~ polyimide content, by weight, in the active material layer was 18.2 %.

The paragraph beginning at page 30, line 16 has been amended as follows:

~~In Experiment 1, The procedure of Experiment 1 was followed to~~  
~~construct a batteries A9 and A10, except that the anode mix slurry~~  
was prepared by mixing 81.8 parts by weight of a silicon powder  
(99.9 % pure) having a mean particle diameter of 3  $\mu\text{m}$ , as active  
material particles, in an 8.6 wt.% N-methylpyrrolidone solution  
containing 18.2 parts by weight of thermoplastic polyimide (binder  
 $\alpha 2$ ) or ~~the other~~ thermoplastic polyimide (binder  $\alpha 3$ ). ~~Otherwise,~~  
~~the procedure of Experiment 1 was followed to construct batteries~~  
~~A9 and A10.~~ In the negative electrode for each of the batteries  
B2, A9 and A10, polyimide was found to have a density of 1.1 g/cm<sup>3</sup>  
and constitute 31.8 % of the total volume of the active material  
layer.